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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/535,621	LI ET AL.
	Examiner	Art Unit
	James Pontius	2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 10-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/29/2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/20/2009*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicants' arguments filed, filed 11/16/2009, with respect to the 35 U.S.C. 101 rejections of claims 1-16 have been fully considered but they are not persuasive. Supreme Court precedent and recent Federal Circuit decisions indicate that a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus); or (2) transform underlying subject matter (such as an article or material) to a different state or thing. Additionally, the use of a particular machine or transformation must impose a meaningful limit on the claim's scope and must involve more than insignificant "extra solution" activity. While instant claims 1-16 recite a series of steps or acts to be performed that are positively tied to another statutory category that accomplishes the claimed method steps, the particular machine does not impose a meaningful limit on the claims' scope and therefore does not qualify as a statutory process. For example, "using digital signal processing circuits including a computer-readable memory circuit connected to receive said encoded video sequence and configured to process said sequence" does not impose a meaningful limit on the claims' scope. This is because use of this particular machine does not involve more than a field of use limitation.

2. The remainder of Applicants' arguments, filed 11/16/2009, with respect to the 35 U.S.C. 103 rejections have been fully considered but they are not persuasive.

3. Applicants assert that Oh fails to teach “decoding the motion vectors of the frame” because Oh only teaches encoding, but not decoding. Examiner respectfully disagrees. As stated in pg 10, lines 26-28 of Oh, “All necessary motion vectors. . . are detected by the adaptive motion estimator”. Further, as stated in pg 17, lines 26-29 of Oh, “the principles of the invention can be incorporated in an integrated circuit for encoding/decoding video data”. Because every principle of the Oh invention is taught to be implemented in a decoding environment, Oh teaches “decoding the motion vectors of the frame”.

4. Applicants assert that Oh fails to teach “estimating global motion between frames” because Oh teaches generating global vectors that relate only to a frame sub-section, but not to a whole frame. Examiner respectfully disagrees. Oh teaches using groups of macroblocks to determine the global motion estimation between frames. There is nothing in applicants’ claim language which prevents performing global motion estimation in such a manner. Furthermore, as stated in pg 9, lines 13-19 of Oh,

> The global motion estimator is updated with MB motion vectors from the past processed pictures by the adaptive motion estimator. The preceding pictures motion vectors are used to generate one or more global motion vectors for each group of MBs in a new picture to be coded based on the type of global motion estimator selected. Generated global motion vectors are used to offset

search windows of all MBs in the corresponding group of MBs. For the case of more than one global motion vector, a comparison at MB level is done and the global motion vector that gives the best result is chosen.

Thus Oh teaches global motion estimation between a preceding picture and a new picture.

5. Applicants assert that Oh fails to teach “calculation of any error value for motion estimation for sets of motion vectors” because Oh only describes use of error values in the matching of blocks or macroblocks. Examiner respectfully disagrees. The matching of macroblocks between two frames is the process of motion estimation. As correspondingly stated in pg 10, line 26-29 of Oh, “All necessary motion vectors, for example the frame and/or field, forward and/or backward, and 16x16/16x8/8x8 motion vectors, for each MB are detected by the adaptive motion estimator 102 by matching the MB to candidate blocks obtained from one or more search windows from a reference picture stored in a frame buffer 103”. Further, as stated in the same paragraph, pg 11, line 4-6 of Oh, “The matching criterion may be based on minimum of absolute errors, square errors, or other suitable distortion functions”. Since the matching of blocks between frames is based on error, and this same matching of blocks between frames is defined to be motion estimation, Oh teaches motion estimation using an error value.

6. Applicants assert that Oh fails to teach "selection of any motion estimation for sets of motion vectors as representative of the global motion of the frame with respect to a preceding or succeeding anchor frame" because Oh only selects a prediction of the position of a macroblock in a subsequent image that best matches a block in the current image, and Oh does not select a motion estimation for sets of motion vectors. Examiner respectfully disagrees. As shown above, the matching of macroblocks between two frames is the process of motion estimation. Additionally, as stated in pg 14, line 24-28 of Oh, "The <u>two</u> best macroblock <u>matching predictions</u> obtained from the two search windows are compared and the <u>one</u> giving the best prediction <u>is chosen</u>, with the corresponding MB motion vector assigned to the current MB. If only one <u>global motion vector</u> is used (depending on the type of motion estimator chosen), then the procedure illustrated previously for the first search window is carried out." Thus Oh teaches selection of a motion estimation for global estimation from two possible motion estimations.

7. Applicants assert that Oh in view of Meer fails to teach "calculating a median squared error value for each motion estimation". Examiner respectfully disagrees. As shown above, Oh teaches motion estimation using an error value. While Oh teaches using "absolute errors, square errors, or other suitable distortion functions" for each motion estimation, as stated in pg 11, line 4-6 of Oh, Oh fails to specifically teach using a least median squared error value. A least median squared error value is taught by Meer on pg 62, right column. Using such a least median squared error value as taught

by Meer would improve the Oh device to identify "outliers" which are points severely deviating from the model, and discriminate against these points, thereby optimizing the ability of Oh to generate accurate global motion in the presence outliers. Thus Oh in view of Meer teaches using a median square error value for each motion estimation.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. Claims 1-16 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. Supreme Court precedent and recent Federal Circuit decisions indicate that a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus); or (2) transform underlying subject matter (such as an article or material) to a different state or thing. Additionally, the use of a particular machine or transformation must impose a meaningful limit on the claim's scope and must involve more than insignificant "extra solution" activity. While instant claims 1-16 recite a series of steps or acts to be performed that are positively tied to another statutory category that accomplishes the claimed method steps, the particular machine does not impose a meaningful limit on the claims' scope and therefore does not qualify as a statutory process. For example, "using digital signal processing circuits including a computer-readable memory circuit connected to receive said encoded video sequence and configured to process said sequence" does not

impose a meaningful limit on the claims' scope. This is because use of this particular machine does not involve more than a field of use limitation.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1, 5, 17, 21 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., "Robust Regression Methods for Computer Vision: A Review", International Journal of Computer Vision, 6(1):59-70, 1991).

12. Regarding claim 1,

Oh teaches:

A method of global motion estimation between frames of a motion-compensated inter-frame encoded video sequence, each frame of the sequence having a plurality of motion vectors encoded therein relating the frame to a preceding and/or succeeding frame of the sequence; the method comprising using digital signal processing circuits including a computer-readable memory circuit connected to receive said encoded video

sequence and configured to process said sequence, for a particular inter-frame encoded frame:

a) decoding the motion vectors of the frame (Oh: pg 10, lines 26-28: All necessary motion vectors. . . are detected by the adaptive motion estimator; pg 17, lines 26-29: the principles of the invention can be incorporated in an integrated circuit for encoding/decoding video data;);

b) selecting N sets of the motion vectors, wherein N is an integer value greater than 1 (Oh: pg 12, lines 24-30: In this particular embodiment, three global motion vectors are computed: one representing the average motion vector of the whole row, the other two global motion vectors representing two sub-groups of MBs from the row differentiated by some motion characteristics; pg 13, lines 4-7: separate the MB motion vectors into two groups, Group1 and Group2;);

c) calculating a motion estimation for each set (Oh: pg 12, line 19-22: The global motion estimator 203 is coupled to provide data to the motion characteristics analyser and the motion estimators 204, 205, 206, 207;);

d) calculating a error value for each motion estimation (Oh: pg 11, line 4-6; The matching criterion may be based on minimum of absolute errors, square errors, or other suitable distortion functions;); and

e) selecting the motion estimation as that representative of the global motion of the frame with respect to a preceding or succeeding anchor frame (Oh: pg 14, line 24-26: The two best macroblock matching predictions obtained from the two search windows are compared and the one giving the best prediction is chosen, with the

corresponding MB motion vector assigned to the current MB;).

Oh fails to teach:

d) calculating a **median squared error value** for each motion estimation; and

e) selecting the motion estimation **with the least median squared error value** as that representative of the global motion of the frame with respect to a preceding or succeeding anchor frame.

Meer teaches:

d) calculating a **median squared error value** for each motion estimation (Meer: pg 62, right col); and

e) selecting the motion estimation **with the least median squared error value** as that representative of the global motion of the frame with respect to a preceding or succeeding anchor frame (Meer: pg 62, right col).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Meer with Oh. The teachings of Meer both identifies "outliers", that is points severely deviating from the model, and discriminates against these points (Meer: pg 62, right col), thereby optimizing the ability of Oh to generate accurate global motion in the presence outliers.

13. Regarding claim 5,

Meer teaches:

A method according to claim 1, wherein the selecting step b) further comprises randomly selecting s motion vectors from the available motion vectors for each of the N sets (Meer: pg 64, left col: Subsets of the data are chosen by random sampling) wherein s is the minimum number for sufficiently estimating a geometrical transformation (Meer: pg 64, left col: The points within some error tolerance are called the consensus set of the model. If the cardinality, number of points, of the consensus set exceeds a threshold, the model is accepted and its parameters recomputed based on the whole consensus set. By using a threshold, a minimum number of motion vectors must be used. The error tolerance and the consensus set acceptance threshold must be set a priori, and can be set according to any minimum level, including the minimum number for sufficiently estimating a geometrical transformation.).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Meer with Oh. The teachings of Meer choose subsets of data by random sampling, thereby minimizing the cost function of the Oh method and apparatus (Meer: pg 64, left col).

14. Regarding claim 17, Oh in view of Meer discloses the system limitations of this claim as discussed above with respect to claim 1.

15. Regarding claim 21, Oh in view of Meer discloses the system limitations of this claim as discussed above with respect to claim 5.

16. Regarding claim 32,

Oh teaches:

A computer-readable storage medium containing a computer program or suite of programs arranged such that when executed on a computer system the program or suite of programs causes the computer system to perform the method of claim 1 (Oh: pg 17, line 29 – pg 18, line 1).

17. Claims 2-4 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., “Robust Regression Methods for Computer Vision: A Review”, International Journal of Computer Vision, 6(1):59-70, 1991) as applied to claim 1 above, and further in view of Smolic et al. (Smolic et al., "Long-Term Global Motion Estimation and its Application for Sprite Coding, Content Description, and Segmentation”, IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, Vol. 9, No. 8, December 1999, pages 1227-1242, XP0009333894).

18. Regarding claim 2,

Oh in view of Meer teaches:

A method according to claim 1 (as shown above)

Oh in view of Meer fails to teach:

the step of excluding certain motion vectors with predetermined characteristics from being selected as a member of one of the N sets.

Smolic teaches:

the step of excluding certain motion vectors with predetermined characteristics from being selected as a member of one of the N sets (Smolic: pg 1231, right col, first paragraph).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Smolic with Oh in view of Meer. Excluding motions vectors would reduce the computational complexity of the Oh in view of Meer method and apparatus (Smolic: pg 1231, right col, first paragraph).

19. Regarding claim 3,

Smolic teaches:

wherein the excluded motion vectors include those motion vectors from one or more areas substantially around the boundary of the frame (Smolic: pg 1231, right col, first paragraph: we exclude some points along the image border and along the object border.).

20. Regarding claim 4,

Smolic teaches:

wherein the excluded motion vectors include those motion vectors whose value is substantially zero (Smolic: pg 1231, right col, first paragraph: we evaluate only points where the spatial intensity derivatives have nonzero values).

21. Regarding claim 18, Oh in view of Meer and further in view of Smolic discloses the system limitations of this claim as discussed above with respect to claim 2.

22. Regarding claim 19, Oh in view of Meer and further in view of Smolic discloses the system limitations of this claim as discussed above with respect to claim 3.

23. Regarding claim 20, Oh in view of Meer and further in view of Smolic discloses the system limitations of this claim as discussed above with respect to claim 4.

24. Claims 6-8 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., “Robust Regression Methods for Computer Vision: A Review”, International Journal of Computer Vision, 6(1):59-70, 1991) as applied to claim 1 above, and further in view of Subramaniyan et al. (US Patent Application Publication # 2004/0028134 A1).

25. Regarding claim 6,

Oh in view of Meer teaches:

A method according to claim 1 (as shown above)

Oh in view of Meer fails to teach:

f) testing the selected motion estimation representative of the global motion ; and

g) outputting the selected motion estimation as being representative of the global motion of the frame if the test is passed.

Subramaniyan teaches:

the steps of:

f) testing the selected motion estimation representative of the global motion (Subramaniyan: [0035], comparing the difference metric for each of the final motion vectors in the previous frame with a predetermined threshold; [0049], This process continues until one of 3 conditions are met: [0050], CONDITION 1: The MSAD is below a threshold THRESH4, given by: THRESH4=A*Q+B); and

g) outputting the selected motion estimation as being representative of the global motion of the frame if the test is passed (Subramaniyan: [0035], determining the global motion vector based on the each of the final motion vectors in a previous frame with a difference metric that is below the threshold; [0049], This process continues until one of 3 conditions are met: [0050], CONDITION 1: The MSAD is below a threshold THRESH4, given by: THRESH4=A*Q+B).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Subramaniyan with Oh in view of Meer. Testing the global motion estimation before outputting would improve the Oh in view of Meer method and apparatus by achieving a motion estimation that is high quality while remaining low in complexity (Subramaniyan: [0023]).

26. Regarding claim 7,

Subramaniyan teaches:

wherein the test comprises comparing the selected motion estimation with a threshold value (Subramaniyan: [0049]-[0050], THRESH4), wherein the test is passed if the parameters do not exceed the threshold value (Subramaniyan: [0049]-[0050], [0054] The best MV at the end of the second stage is chosen as the best MV for the macroblock; the MV having a MSAD below THRESH4 is chosen as the best MV).

27. Regarding claim 8,

Subramaniyan teaches:

wherein if the test is failed, the method further comprises:

h) determining a motion estimation representative of the global motion of the frame with respect to a preceding or succeeding other frame (Subramaniyan: [0035]; [0026], motion estimation is computed for blocks of image data from a current image frame using one or more previously processed image frames);

i) determining a motion estimation representative of the global motion of the other frame with respect to the anchor frame ([0035]; the motion estimation circuit 110 can determine the global motion vector by using an average of all final motion vectors in a previous frame); and

j) accumulating the motion estimations to give an overall motion estimation substantially representative of the global motion of the frame with respect to the anchor frame (Subramaniyan: [0035], the motion estimation circuit 110 can determine the global motion vector by using an average of all final motion vectors in a previous frame).

28. Regarding claim 22, Oh in view of Meer and further in view of Subramaniyan discloses the system limitations of this claim as discussed above with respect to claim 6.

29. Regarding claim 23, Oh in view of Meer and further in view of Subramaniyan discloses the system limitations of this claim as discussed above with respect to claim 7.

30. Regarding claim 24, Oh in view of Meer and further in view of Subramaniyan discloses the system limitations of this claim as discussed above with respect to claim 8.

31. Claims 10 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., “Robust Regression Methods for Computer Vision: A Review”, International Journal of Computer Vision, 6(1):59-70, 1991) and Subramaniyan et al. (US Patent Application Publication # 2004/0028134 A1) as applied to claim 6 above, and further in view of Lee et al. (US Patent Application Publication # 2003/0103568 A1).

32. Regarding claim 10,

Oh in view of Meer and Subramaniyan teaches:

A method according to claim 6 (as shown above)

Oh in view of Meer and Subramaniyan fails to teach:

wherein if the test is failed, the method further comprises:

interpolating between the motion estimations of adjacent frames to give an interpolated motion estimation which is then output as the motion estimation representative of the global motion of the frame.

Lee teaches:

wherein if the test is failed, the method further comprises:

interpolating between the motion estimations of adjacent frames to give an interpolated motion estimation which is then output as the motion estimation

representative of the global motion of the frame (Lee: [0061]-[0063]).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Lee with Oh in view of Meer and Subramaniyan. The teachings of Lee provide for motion compensated interpolation that eliminates blocking artifacts (Lee [0048]), thereby increasing the ability of Oh in view of Meer and Subramaniyan to generate accurate global motion in the presence of blocking artifacts.

33. Regarding claim 25, Oh in view of Meer and Subramaniyan and further in view of Lee discloses the system limitations of this claim as discussed above with respect to claim 10.

34. Claims 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., "Robust Regression Methods for Computer Vision: A Review", International Journal of Computer Vision, 6(1):59-70, 1991) as applied to claim 17 above, and further in view of Jinzenji et al. (US Patent # 6,977,664 B1).

35. Regarding claim 26,

Oh in view of Meer teaches:

A system for generating panoramic images from a motion-compensated inter-frame encoded video sequence, comprising:

a system for global motion estimation between frames of a motion-compensated inter-frame encoded video sequence as claimed in claim 17 (as shown above), and further arranged to provide global motion estimations for each frame (Oh: pg 9, lines 13-19);

Oh in view of Meer fails to teach:

panoramic image generating means for generating at least one panoramic image representing the frames of the video sequence using the global motion estimations thus determined.

Jinzenji teaches:

panoramic image generating means for generating at least one panoramic image representing the frames of the video sequence using the global motion estimations thus determined (Jinzenji col 8, line 32-56; a provisional sprite <panoramic image> is generated).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Jinzenji with Oh in view of Meer. Using the panoramic generating means of Jinzenji would allow for creation of a panoramic image

based on the global motion of Oh in view of Meer, thereby allowing a user to implement an established use for global motion.

36. Regarding claim 27,

Jinzenji teaches:

wherein the panoramic image generating means is further arranged in use to:

select a particular frame of the sequence as a reference frame, the plane of the reference frame thereby being a reference plane (Jinzenji col 8, line 32-56; the reference coordinate system which is for the reference frame);

for each frame other than the reference frame, accumulate the global motion estimations from each frame back to the reference frame (Jinzenji col 8, line 32-56; each original image of the arbitrary frames is mapped to a reference coordinate system which is for the reference frame);

warp each frame other than the reference frame onto the reference plane using the accumulated global motion estimations to give one or more pixel values for each pixel in the reference plane (Jinzenji col 8, line 32-56; frame warping occurs when frames are mapped to the reference coordinate system using global motion so as to insert or overwrite pixels); and

for each pixel position in the reference plane, select one of the available pixel values for use as the pixel value in the panoramic image (Jinzenji col 8, line 32-56; a pixel value of a point is obtained from pixel values which exist in the same point).

37. Regarding claim 28,

Jinzenji teaches:

wherein the panoramic image generating means is further arranged to select a substantially median pixel value from the available pixel values for use in a background panoramic image (Jinzenji col 10, line 8-11; for a plurality of pixels which are mapped to the same coordinates, a median value of the pixels is selected as the value of the coordinates of the provisional sprite).

38. Regarding claim 29,

Jinzenji teaches:

wherein the panoramic image generating means is further arranged to select a substantially most different pixel value from the available pixel values for use in a foreground panoramic image (Jinzenji col 8, line 47-51; using a threshold to select the most different pixel).

39. Claims 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., “Robust Regression Methods for Computer Vision: A Review”, International Journal of Computer Vision, 6(1):59-70, 1991) and Jinzenji et al. (US Patent # 6,977,664 B1) as applied to claim 27 above, and further in view of Szeliski et al. (US Patent # 6,348,918 B1).

40. Regarding claim 30 and 31,

Oh in view of Meer and Jinzenji teaches:

A system according to claim 26 (as shown above),

Oh in view of Meer and Jinzenji fails to teach:

wherein the panoramic image generating means is further arranged to:

calculate the mean pixel value of the available pixel values;

calculate the L1 distance between each available pixel value and the calculated mean pixel value; and

select the pixel value with the median L1 distance for use in a background panoramic image.

select the pixel value with the maximum L1 distance for use in a foreground panoramic image.

Szeliski teaches:

wherein the panoramic image generating means is further arranged to:

calculate the mean pixel value of the available pixel values (Szeliski col 8, line 57-65; taking the mean of the color or intensity values);

calculate the L1 distance between each available pixel value and the calculated mean pixel value (Szeliski col 8, line 57-65; where the averaging is weighted by the distance of each pixel from the nearest invisible pixel); and

select the pixel value with the median L1 distance for use in a background panoramic image (Szeliski col 8, line 57-65; using the median technique).

select the pixel value with the maximum L1 distance for use in a foreground panoramic image (Szeliski col 8, line 57-65; the simplest technique is the median technique, but many others exist. This portion of Szeliski discloses blending specifically for a background image. This portion of Szeliski also discloses blending generally. Instead of using the median technique for blending background pixels, a maximum technique is obvious for blending foreground pixels. This is because foreground pixels are most different from background pixels).

It would have been obvious to a person having ordinary skill in the art to combine the teachings of Szeliski with Oh in view of Meer and Jinzenji. Using the blending technique of Szeliski would smooth out disparities of the panoramic image of Oh in view of Meer and Jinzenji, thus creating a panoramic image with increased image quality (Szeliski col 9, line 6-8).

41. Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., “Robust Regression Methods for Computer Vision: A Review”, International Journal of Computer Vision, 6(1):59-70, 1991), and further in view of Jinzenji et al. (US Patent # 6,977,664 B1).

42. Regarding claim 11,

Oh teaches:

A method of generating panoramic images from a motion-compensated inter-frame encoded video sequence, the method comprising using digital signal processing circuits including a computer-readable memory circuit connected to receive said encoded video sequence and configured to process said sequence by:

for each frame of the sequence, determining the global motion of each frame with respect to its anchor frame by estimating global motion between frames of a motion-compensated inter-frame encoded video sequence (Oh: pg 9, lines 13-19):

a) decoding the motion vectors of the frame (Oh: pg 10, lines 26-28: All necessary motion vectors. . . are detected by the adaptive motion estimator; pg 17, lines 26-29: the principles of the invention can be incorporated in an integrated circuit for encoding/decoding video data;);

b) selecting N sets of the motion vectors, wherein N is an integer value greater than 1 (Oh: pg 12, lines 24-30: In this particular embodiment, three global motion vectors are computed: one representing the average motion vector of the whole row, the other two global motion vectors representing two sub-groups of MBs from the row differentiated by some motion characteristics; pg 13, lines 4-7: separate the MB motion vectors into two groups, Group1 and Group2;);

c) calculating a motion estimation for each set (Oh: pg 12, line 19-22: The global motion estimator 203 is coupled to provide data to the motion characteristics analyser and the motion estimators 204, 205, 206, 207;);

d) calculating a error value for each motion estimation (Oh: pg 11, line 4-6; The matching criterion may be based on minimum of absolute errors, square errors, or other suitable distortion functions;); and

e) selecting the motion estimation as that representative of the global motion of the frame with respect to a preceding or succeeding anchor frame (Oh: pg 14, line 24-26: The two best macroblock matching predictions obtained from the two search windows are compared and the one giving the best prediction is chosen, with the corresponding MB motion vector assigned to the current MB;).

Oh fails to teach:

d) calculating a **median squared error value** for each motion estimation; and

e) selecting the motion estimation **with the least median squared error value** as that representative of the global motion of the frame with respect to a preceding or succeeding anchor frame.

f) generating at least one panoramic image representing the frames of the video sequence using the global motion estimations thus determined.

Meer teaches:

d) calculating a **median squared error value** for each motion estimation (Meer: pg 62, right col); and

e) selecting the motion estimation **with the least median squared error value** as that representative of the global motion of the frame with respect to a preceding or succeeding anchor frame (Meer: pg 62, right col).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Meer with Oh. The teachings of Meer both identifies "outliers", that is points severely deviating from the model, and discriminates against these points (Meer: pg 62, right col), thereby optimizing the ability of Oh to generate accurate global motion in the presence outliers.

Jinzenji teaches:

f) generating at least one panoramic image representing the frames of the video sequence using the global motion estimations thus determined (Jinzenji col 8, line 32-56; a provisional sprite <panoramic image> is generated).

At the time of invention, it would have been obvious to a person having ordinary skill in the art to combine the teachings of Jinzenji with Oh in view of Meer. Using the panoramic generating means of Jinzenji would allow for creation of a panoramic image based on the global motion of Oh in view of Meer, thereby allowing a user to implement an established use for global motion.

43. Regarding claim 12, Jinzenji teaches:

A method according to claim 11, wherein the generating step further comprises:

selecting a particular frame of the sequence as a reference frame, the plane of the reference frame being a reference plane (Jinzenji col 8, line 32-56; the reference coordinate system which is for the reference frame);

for each frame other than the reference frame, accumulating the global motion estimations from each frame back to the reference frame (Jinzenji col 8, line 32-56; each original image of the arbitrary frames is mapped to a reference coordinate system which is for the reference frame);

warping each frame other than the reference frame onto the reference plane using the accumulated global motion estimations to give one or more pixel values for each pixel position in the reference plane (Jinzenji col 8, line 32-56; frame warping occurs when frames are mapped to the reference coordinate system using global motion so as to insert or overwrite pixels; and

for each pixel position in the reference plane, selecting one of the available pixel values for use as the pixel value in the panoramic image (Jinzenji col 8, line 32-56; a pixel value of a point is obtained from pixel values which exist in the same point).

44. Regarding claim 13, Jinzenji teaches:

A method according to claim 12, wherein the selecting step comprises selecting a substantially median pixel value from the available pixel values for use in a background panoramic image (Jinzenji col 10, line 8-11; for a plurality of pixels which

are mapped to the same coordinates, a median value of the pixels is selected as the value of the coordinates of the provisional sprite).

45. Regarding claim 14, Jinzenji teaches:

A method according to claim 12, wherein the selecting step comprises selecting a substantially most different pixel value from the available pixel values for use in a foreground panoramic image (Jinzenji col 8, line 47-51; using a threshold to select the most different pixel).

46. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (International Pub. No. WO 00/70879) in view of Meer et al. (Meer et al., "Robust Regression Methods for Computer Vision: A Review", International Journal of Computer Vision, 6(1):59-70, 1991) and Jinzenji et al. (US Patent # 6,977,664 B1) as applied to claim 11 above, and further in view of Szeliski et al. (US Patent # 6,348,918 B1).

47. Regarding claims 15-16,

Oh in view of Meer and Jinzenji teaches:

A method according to claim 12 (as shown above),

Oh in view of Meer and Jinzenji fails to teach:

wherein the selecting step comprises:

calculating the mean pixel value of the available pixel values;

calculating the L1 distance between each available pixel value and the calculated mean pixel value; and

select the pixel value with the median L1 distance for use in a background panoramic image.

select the pixel value with the maximum L1 distance for use in a foreground panoramic image.

Szeliski teaches:

wherein the selecting step comprises:

calculating the mean pixel value of the available pixel values (Szeliski: col 8, line 57-65; taking the mean of the color or intensity values);

calculating the L1 distance between each available pixel value and the calculated mean pixel value (Szeliski: col 8, line 57-65; where the averaging is weighted by the distance of each pixel from the nearest invisible pixel); and

select the pixel value with the median L1 distance for use in a background panoramic image (Szeliski: col 8, line 57-65; using the median technique).

select the pixel value with the maximum L1 distance for use in a foreground panoramic image (Szeliski: col 8, line 57-65; the simplest technique is the median technique, but many others exist. This portion of Szeliski discloses blending specifically for a background image. This portion of Szeliski also discloses blending generally.

Instead of using the median technique for blending background pixels, a maximum technique is obvious for blending foreground pixels. This is because foreground pixels are most different from background pixels).

It would have been obvious to a person having ordinary skill in the art to combine the teachings of Szeliski with Oh in view of Meer and Jinzenji. Using the blending technique of Szeliski would smooth out disparities of the panoramic image of Oh in view of Meer and Jinzenji, thus creating a panoramic image with increased image quality (Szeliski col 9, line 6-8).

Conclusion

48. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

49. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Pontius whose telephone number is (571) 270-7687. The examiner can normally be reached on Monday - Thursday, 8 AM - 4 PM est..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/James Pontius/
Examiner, Art Unit 2621

/Dave Czekaj/
Primary Examiner, Art Unit 2621